Near Detector Work in 2003

There are a variety of tasks to do during 2003 in preparation for Near Detector installation. There are some fabrication jobs, all involving items which are installed in the electronics racks. There are some coordination jobs, such as the Hall LAN layout, and getting all cables approved for use. And there are some "installation methods" jobs, mostly involving the cabling prototype in New Muon.

Coordination Jobs

These jobs all involve being on-site at FNAL for some amount of time – the coordination is between the experiment and FNAL support and/or safety groups, after all. None of these jobs is particularly full time, however, and can be performed during regular visits to the Lab.

Near Hall LAN coordination

The Computing Div Networking group will design and install the LAN system for the experiment according to our specifications. The outfitting contractor is installing fiber, both for LAN and Accelerator Controls, in the MINOS shaft; however the contractor is NOT terminating this fiber either above or below ground. Therefore, after BO, one of the first tasks to do in installing the detector is to connect the fiber above ground to the existing FNAL network structure, and to install the LAN distribution underground in the Hall. The Networking group needs to know what we require, and needs a person on the experiment who gives them specifications, and who handles a sign-off process for the design. This is more than just counting the number of ports needed underground – we expect to need a "dedicated" data path direct from the Hall to Feynman, and at least 1 (or more?) isolated sub-nets for the DAQ and Control Room. Some DCS devices must be behind a firewall to conform to lab security standards, and Gary Drake requires the use of optically isolated Ethernet lines for those which connect to devices in electronics racks. Coordination is with Networking for the overall design, and with the MINOS DAQ, DCS and Electronics groups to gather specifications. Timescale – the design should be final by October 2003, to allow for ample time for a contract for the actual labor (Networking arranges and oversees, but hires outside contractors to do most of the work). Assume it takes 4 months to arrive at a final design – 1 to 2 months to gather specifications. Serious effort should begin by April 2003.

Near Hall Electrical and Grounding layout coordination

The outfitting contractor installs electrical systems, from where the power is taken off a main feeder above ground, to circuit board panels underground. The wiring stops in the circuit board panels, however. After BO, Near Installation will pay for some weeks of electrical contractor work, to install individual circuits, from the panel boards to various outlet locations distributed around the Hall. The FNAL PPD Site Support group oversees this electrical contractor work. This group needs to know what we require, and they will have plans drawn up for the work. The specifications need to list the location and circuit/plug type of every outlet in the Hall, not just for those outlets which support the detector readout electronics. The outfitting contractor will install a safety ground cable around the Hall. Gary Drake has specific requirements on the path between the electronics, the power supplies, and the Hall ground; these requirements may impact how racks are installed and connected to the safety ground. **Jonathon Thron is considering volunterring for this coordination task.** Time scale: similar to that for the LAN – serious work should begin by April, with a goal of having plans complete by October.

Cable Approval coordinator

All cables used underground must (a) have a rating as to it's flammability, and (b) must be approved for use based on it's rating and it's specific location. Jonathon and Cat have started the cable approval process by updating a Cable Spreadsheet which lists every cable used underground. The next step is to obtain the ratings of all these cables. For most this is a matter of looking up specifications; for example, cables which are identical to those used at the Far Detector, such as the clear fiber conduit and the HV cables, have already been rated and approved. For cables which have no documented rating, Beams Division has set up a procedure to test the flammability and assign a rating. Once all ratings are gathered, approval is obtained by presenting cable rating and usage information to Jim Priest, of FNAL ES&H. Rejection of any cables must be handled on a case-by-case basis. The time-scale is ASAP – some cables which have not gone through this process have already been purchased, and we need sufficient time to replace any rejected cables.

Installation Methods

This job involves spending time at FNAL, working on the detector planes. The current plan is to install cables when a plane is underground in the Hall, but before it is is placed onto the detector, when it is on the cart fixture which brought the plane from the shaft into the Hall.

This fixture can be brought into the New Muon lab at any time, and the techs can remove one of the assembled planes and put it onto the cart fixture. We can then clock ourselves as to the time required to attach cables while a plane is on this fixture. In addition to the readout cables, the techs also must attach Bdot cables when a plane is on the cart, and so they can practice this technique at the same time. The time scale for this job can be anytime a set of willing collaborators can coordinate their travel plans to be here at the same time. Cat prefers there be 2 or 3 (or more) collaborators to participate in this practice – these people must agree to document the results and conclusions, and must also expect to be on-site during the real installation in 2004 to train additional collaborators. The best time to do this practice is soon after the March collaboration meeting, so that results can be presented at the June collaboration meeting. This exercise can be repeated if necessary, and is not restricted to being a one-time deal. It is expected to require at least a few days, to allow for several practice trials – plan perhaps for a week's stay at FNAL.

Even if cabling at the module end is done before planes are mounted, techniques must still be developed to replace cables after they are installed. We also must confirm the readout cable support design. All this is done using the cabling mock-up on Stand 4 in New Muon. This job can be done by the same people who work on the cabling practice described above, at the same time or during a different time period. The preference is again to have at least a first pass completed by the June collaboration meeting. While it is clear that replacing fiber readout cables on installed planes is doable, it is not so obvious that LI cables can be dependably replaced on the partial planes, for which the attachment point is difficult to reach. And, even if cables are attached, we need to be certain that the attachment is successful, meaning that light is transmitted. Therefore those involved need to think creatively about simple transmission tests which do not require extensive readout hardware. Such a test, if developed, will also be useful to test that attachment of cables on the cart fixture was performed successfully.

Fabrication jobs

All of these jobs involve spending some amount of time at FNAL, mostly in the initial design phase and in the final installation phase, when the fabricated items are installed in the racks. The actual fabrication, for most jobs, can occur anywhere. Near Installation will purchase and provide all parts; labor to be negotiated on a case by case basis. So, for example, a collaborator volunteering to make air intake panels can participate in the design, and then oversee the fabrication back at their university, or oversee the fabrication process at FNAL.

Front-end rack Fan Packs

Similar to the fan packs made by PPD-EE for the Master racks, but only 1u high and holding only 5 fans. 44 of these are required, with spares perhaps 50 will be fabricated. The fan unit type has been specified by previous air-flow tests. The RPS needs input from a tachometer board in each fan pack, just as for those made for the Master racks, and this board will be provided along with installation instructions. The sheet metal box can be provided or made at a university shop following provided drawings. This job is mostly a matter of getting the fan packs made, as the design is mostly done. The time scale is anytime after March, with delivery due by October. Parts ordering lead time means all parts probably won't be in hand until April.

Power cable harness

Cables which provide the connection between LVDC power supplies and electronics crates in both the FE and Master racks. The harness provides support for the routing of the power cables, and the routing path must be designed so as not to block air flow, not to interfere with piping, and to allow relative ease if a crate needs to be replaced. PPD-EE safety rules must be followed as to wire sizes and in-line fuses. Wire insulation must go through Cable Review process. Dave Huffman of PPD-EE has agreed to either do or assist in the design. Fabrication can be done anywhere once a design and the materials are approved. There are 2 sets of power cables in Forward section FE racks, and 1 set in Spectrometer section FE racks, and 1 set in each Master rack, and each will be similar but with slight differences. Total is 52 sets, no spares planned. The design depends on

having production crates and power supplies in-hand, which will not be until summer 2003, so this job can be scheduled for summer-fall 2003.

Air Intake Panels for FE racks and Master racks

Both rack types are completely enclosed to ensure air flow through critical areas. Air intakes, with filters, must be designed. FE racks have high air flow rates and will need intakes in both the front and rear of the rack; Master racks will need just one front intake. The plan is to use ordinary furnace filters, and design a panel which holds them, while allowing for adequate air flow, and ease of filter replacement. None of this design work has been done.

Air Flow Sensor Mounts

Each FE and Master rack will contain a pair of boards, which provide air flow and air temperature data to the RPS. Duluth provides the sensor boards and the readout wiring. The Job is to design and fabricate a device to mount the boards on and position them at the appropriate location with the racks. Need 52 for FE racks, and 16 for Master racks. No design work done yet.

Drip Sensor Mounts

Similar to air flow mounts described above. Required only for FE racks, and only 1 per rack, for a total of 26. No design work done yet.

Other Jobs – to be done by FNAL Techs

In case you are curious, there are a few jobs that seem appropriate to keep at FNAL for the local techs to do. The main one is the water plumbing in the FE racks, which also includes fabricating all the water-cooled heat-sink copper shelves for the phototube boxes. They will also make custom-sized sheet metal panels for the back of the FE racks – rack doors or panels from a catalog won't work, as the phototubes must be accessible from the back of the rack, and cannot be covered. The techs will also devise a mount for the smoke detectors, although this job could also be done by collaborators if any are interested.